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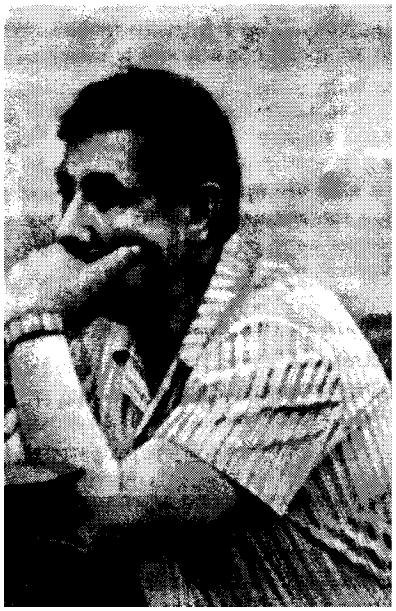
Aleksei Georgievch Postnikov (obituary)

The Russian mathematician Aleksei Georgievich Postnikov finished his earthly journey on 22 March 1995, aged 73. He was born in Moscow into an Orthodox family on 12 June 1921.



Postnikov's paternal great-grandfather was Egor Vasil'evich Amfiteatrov (1815–1888). According to the Full Orthodox Theological Dictionary he graduated from the St. Petersburg Ecclesiastical Academy, was a professor of philology there, was elected mayor of Sergiev Posad in 1873 and at the time of his death held the rank of state councillor. Postnikov's grandfather Vassilii Ivanovich Postnikov was a priest. Bishop Arsenii (Zhadanovskii) wrote the following about him in his memoirs. "Father Vassilii Postnikov can be justifiably considered the best representative of the Moscow clergy. He was an enlightened talented person, a good preacher and, most importantly, a highly motivated and eager servant of God's altar, as a pastor of the capital should be." The father, Georgii Vassil'evich Postnikov, graduated from the Faculty of Law of Moscow University and worked in the Supreme Soviet for National Economy. He was arrested in 1929 and again in 1938. In 1956 he was posthumously rehabilitated. The mother was the eldest daughter of the second guild merchant Semen Alekseevich Bogomolov.

In 1931 Aleksei Postnikov went to Moscow School No. 59, straight into the third year. He always remembered the teachers of this school with great tenderness and gratitude. This school, which was created from a former grammar school and kept most of the old staff, managed to survive the experiments that most schools had to endure, such as the brigade method of teaching, testing pupils for a future profession and many others. Pupils who graduated from this school were well educated and many of them later became well-known qualified specialists. Postnikov often recalled that an atmosphere of benevolence and cooperation was created at the school and this especially helped those children from poorer families.

After finishing school in 1939, Postnikov entered the Mathematics Department in the Faculty of Mechanics and Mathematics at Moscow State University. The years of study came at a difficult time for the whole country: the Great Patriotic War began in 1941. His studies had to be temporarily suspended and he graduated from the university only in 1946. That same year he was admitted as a post-graduate to the Scientific Research Institute of Mathematics at Moscow State University. The formation of Postnikov's creative personality began under the influence of N. N. Luzin, P. S. Aleksandrov, A. N. Kolmogorov, A. O. Gel'fond, B. V. Gnedenko, V. V. Stepanov, A. Ya. Khinchin and others. In 1949 he defended his Ph.D. dissertation, "On the differential independence of Dirichlet series".

In 1950 he started work at the Steklov Institute of Mathematics, in the Department of Number Theory then headed by Ivan Matveevich Vinogradov. Here it must be said that it is impossible to overestimate Vinogradov's influence on Postnikov's subsequent creative growth and establishment as a personality. A life inseparable from the life of the Institute of Mathematics had begun for Aleksei Georgievich. His active and fruitful scientific work took off. As is well known, the post-war years were years of rapid growth in science in the USSR. New scientific groups were being formed, various mathematical schools were working together, and Postnikov's seminar at the Institute on the method of trigonometric sums can be regarded as being in the same stream. Postnikov began a close scientific and friendly relationship with the Leningrad School of Number Theory, especially with Yurii Vladimirovich Linnik and his students.

In the mid-1950s Postnikov's work on trigonometric sums received acclaim among mathematicians. The article [10] was published in 1955. In it there appeared Postnikov's famous formula on the representation of Dirichlet characters modulo a power of a prime via the exponent of a polynomial, which reduces the problem of estimating character sums to that of estimating Weyl's trigonometric sums. It was first heard by I. M. Vinogradov and Yu. V. Linnik, who encouraged Postnikov to write a D.Sc. dissertation. We would like to note that this formula is now called Postnikov's formula. It laid the foundations of a whole new direction in analytic number theory. In 1956 Postnikov defended his D.Sc. dissertation, "Investigation of the method of I. M. Vinogradov for trigonometric sums ".

The results of his scientific activity have been published in more than fifty articles and four monographs: *Arithmetical modelling of random processes* (1960), *Ergodic aspects of the theory of congruences and of the theory of Diophantine approximations* (1966), *Introduction to analytic number theory* (1971), *Tauberian theory and its applications* (1979).

Postnikov's scientific activity began with investigations on the differential-difference independence of Dirichlet series. This topic extended and generalized Hilbert's theorem on the differential independence of the Riemann ζ-function.

In the papers "On the structure of two-dimensional Diophantine approximations", "The remainder term in the Tauberian theorem of Hardy and Littlewood" and "A simplification of A. Selberg's elementary proof of the prime number theorem", it can be seen how Postnikov was searching for a field to attract his interest and apply his energy. Beginning with the papers "On character sums modulo a prime power", "On the distribution of the fractional parts of the exponential

function" and "Some general theorems on the uniform distribution of fractional parts", his mathematical tastes were defined.

In the theory of the uniform distribution of the fractional parts of an exponential function Vinogradov's method of estimating Weyl's sums was extended to sums with an exponential function in the exponent. A criterion for the uniform distribution of the fractional parts of an exponential function in a Gaussian field was obtained [23].

Postnikov's next series of articles were related to Bernoulli- and Markov-normal sequences of symbols in the representation of a number in a positional number system.

The central result here was his discovery of a criterion for a uniform distribution modulo one [21] and a criterion for a completely uniformly distributed sequence [27].

A special place in Postnikov's work is occupied by theorems of Abelian and Tauberian types [4], [8], [9]. Here Postnikov was the first to study theorems of Tauberian type in a complex domain with a remainder term.

A large number of Postnikov's papers are devoted to probabilistic number theory. One of his first results was a version of the famous theorem of Delange with a remainder term [47].

In probability theory he frequently considered problems on estimates of the concentration function and of the maximum probability for sums of independent vectors.

Using methods of the geometry of numbers in [54], [56] he obtained improved estimates for the concentration function and a new estimate for the maximum probability of independent integer random vectors which explicitly takes account of the parameters of the summand distributions.

Both mathematicians who worked with Aleksei Georgievich at seminars and conferences and his pupils remember well how he was always deeply interested in results where number theory was used in other areas of mathematics and vice versa, and in case when the methods of other sciences presented an opportunity for new results in number theory to be obtained. Ergodic theory, probability theory and modelling of random sequences were areas in which he found such applications. Postnikov constantly underlined analogies between number theory and analysis. These analogies comprise the methodological base for the application of probabilistic methods in the study of the distribution of values of arithmetic functions.

From 1953 onwards and on Vinogradov's initiative, Postnikov was actively searching for an elementary proof of the Hasse-Weil estimate for the sum of characters of a polynomial. This search led to a new method of estimating such sums. In 1967, after the all-Union school on number theory in Dushanbe, Postnikov found an elementary proof of the theorem on the lower bound of the number of solutions of an elliptic congruence modulo a prime. The method proposed by Postnikov was developed further in works of Russian and foreign mathematicians.

Postnikov took a very active part in organising and conducting workshops, conferences, congresses and other research-oriented work.

He paid a lot of attention to mathematical education, devoting much strength and energy to the supervision of postgraduates and trainees, giving lectures and

conducting seminars in the Steklov Institute of Mathematics and at a number of universities (Saratov, Kazan', Alma-Ata, Vilnius and others). He successfully supervised a number of students for the degrees of Ph.D. and D.Sc.. Aleksei Georgievich was a man who selflessly helped others.

Number Theory	Analysis
sequence of positive integers	interval $[0,1]$ on the real axis
arithmetic progression with common difference D	interval $[a/D,(a+1)/D)$
asymptotic density of a set M of positive integers, $D(M)=\lim_{N\to\infty}\frac{1}{N}\sum_{n\le N,n\in M}1$	Lebesgue measure of a set of numbers in the interval $[0,1]$
sum $\frac{1}{N}\sum_{n=1}^{N}f(n)$ of a function $f(x)$ defined on the interval $[0,1]$	integral sum
periodic function of integer argument with integer period D	function piecewise constant on the intervals $[a/D,(a+1)/D$

He stood out in his benevolence in communicating with others. People learned from him. They learned to see the deep currents of life, they learned to be faithful to the truth.

Bright memories of Aleksei Georgievich Postnikov will forever remain in our hearts.

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